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10/714,794

11/17/2003

Chuen-Rong Leu

BDG024

2971

23931

7590

10/26/2005

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EXAMINER

WILLIAMS, ALEXANDER O

ART UNIT

PAPER NUMBER

2826

DATE MAILED: 10/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/714,794

Applicant(s)

LEU ET AL.

Examiner

Alexander O. Williams

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 08 September 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-110 is/are pending in the application.
- 4a) Of the above claim(s) 2, 7, 12, 13, 15, 19-21, 23, 24, 26-28, 38, 39, 42, 45, 47, 49, 53, 59, 60, 63, 65 and 69-99 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) See Continuation Sheet is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>11/17/03 &amp; 11/24/03</u> . | 6) <input type="checkbox"/> Other: _____  |

Continuation of Disposition of Claims: Claims rejected are 1,3-6,8-11,14,16-18,22,25,29-37,40,41,43,44,46,48,50-52,54-58,61,62,64,66-68 and 101-110.

Art Unit: 2826

Serial Number: 10/714794    Attorney's Docket #: BDG024  
Filing Date: 11/17/2003;

Applicant: Leu et al.

Examiner: Alexander Williams

This application a continuation-in-part of U.S. Application Serial No. 10/235331 filed September 5, 2002, which is a divisional of U.S. application Ser. No. 09/939,140 filed Aug. 24, 2001, which is a continuation-in-part of U.S. application Ser. No. 09/878,626 filed Jun. 11, 2001, which is a continuation-in-part of U.S. application Ser. No. 09/687,619 filed Oct. 13, 2000 now U.S. Pat. No. 6,440,835

This application also claims the benefits of U.S. Provisional Application Serial No. 60/509299 filed October 7, 2003, and U.S. Provisional Application Serial No. 60/507145 filed September 30, 2003.

Applicant's Pre-Amendment filed 9/7/2004 has been acknowledged.

Applicant's Amendment/Election with traverse of the species of figures 19A, 19B and 19C (claims 1, 3-6, 8-11, 14, 16-18, 22, 25, 29-37, 40, 41, 43, 44, 46, 48, 50-52, 54-58, 61, 62, 64, 66-68 and 101-110), filed 9/8/05, has been acknowledged. However, the figure of 19A-19C show that the routing line is connected to the pillar, not spaced away from. Therefore, claims 41, 43, 44, 46, 48, 50-52, 54-58, 61, 62, 64 and 66-68 appear to **NOT** read on the elected species of figures 19A-19C and appear to should have been withdrawn also by the election at this time for being part of another species. Also, claims 25, 37, 40, 106, 107 and 110 appear to **NOT** read on the elected species of figures 19A-19C and appear to should have been withdrawn also by the election at this time for being part of another species. If this is correct, these claims should also be withdrawn

This application contains claims 2, 7, 12, 13, 15, 19-21, 23, 24, 26-28, 38, 39, 42, 45, 47, 49, 53, 59, 60, 63, 65 and 69-99 drawn to an invention non-elected with traverse. A complete response to the final rejection must include cancellation of non-elected claims or other appropriate action (see 37 CFR § 1.144 & MPEP § 821.01).

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

The use of the trademark Enthone Enplate NI-424 on page 34, line 25 or any others used has been noted in this application. It should be capitalized wherever it appears and be accompanied by the generic terminology.

Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

The disclosure is objected to because of the following informalities: Applicant's related application information should be updated.

Appropriate correction is required.

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the connection joint includes a nickel layer and a gold layer, the nickel layer contacts the routing line and the pad, and the gold layer is spaced from the routing line and the pad in claims 25 and 37; and the first and second surfaces of the pillar have a circular shape in claim 106; the first surface of the pillar is concentrically disposed within a surface area of the second surface of the pillar in claim 107; the pillar is copper and has a conical shape, the first and second surfaces of the pillar are flat and parallel to one another and have a circular shape, and the first surface of the pillar is concentrically disposed within a surface area

of the second surface of the pillar in claim 110 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

The drawings are objected to because

Correction is required.

Claims 25, 37, 40, 41, 43, 44, 46, 48, 50-52, 54-58, 61, 62, 64, 66-68 and 101 to 110 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 25 and 37, it is unclear and confusing to what is meant by "the connection joint includes a nickel layer and a gold layer, the nickel layer contacts the routing line and the pad, and the gold layer is spaced from the routing line and the pad." Where is the multiple layered structure shown? Where is this shown in the drawings of the elected species of figures 19A-19C?

In claim 40, it is unclear and confusing to what is meant by "the assembly is devoid of wire bonds and TAB leads." Where is this shown in the drawings of the elected species of figures 19A-19C?

In claims 41 and 61, it is unclear and confusing to what is meant by "the first surface of the pillar faces away from and is **spaced from** the routing line." Where is this shown in the drawings of the elected species of figures 19A-19C?

In claims 101 to 110, the dependency of these claims which can be depending on (possibly 41, 61) 71, 81 and 91 is confusing since the elected species does not include these independent claims.

In claim 106, it is unclear and confusing to what is meant by "wherein the first and second surfaces of the pillar have a circular shape." Where is this shown in the drawings of the elected species of figures 19A-19C?

In claim 107, it is unclear and confusing to what is meant by "the first surface of the pillar is concentrically disposed within a surface area of the second surface of the pillar." Where is this shown in the drawings of the elected species of figures 19A-19C?  
In claim 107, it is unclear and confusing to what is meant by "the pillar is copper and has a conical shape, the first and second surfaces of the pillar are flat and parallel to one another and have a circular shape, and the first surface of the pillar is concentrically disposed within a surface area of the second surface of the pillar." Where is this shown in the drawings of the elected species of figures 19A-19C?

Any of claims 25, 37, 40, 41, 43, 44, 46, 48, 50-52, 54-58, 61, 62, 64, 66-68 and 101 to 110 not specifically addressed above are rejected as being dependent on one or more of the claims which have been specifically objected to above.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 3-6, 8-11, 14, 16-18, 29-36, 101-105 and 109, **insofar as they can be understood**, are rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakatani et al. (U.S. Patent # 6,038,133) in view of Lin (U.S. Patent # 6,402,970 B1).  
1. Nakatani et al. (figures 1 to 6) specifically figure 3(h) show a semiconductor chip assembly, comprising: a semiconductor chip **304** that includes first and second opposing surfaces, wherein the first surface of the chip includes a conductive pad **(inherent)**; a conductive trace that includes a routing line **303** and a pillar **309**, wherein the pillar includes first and second opposing surfaces and the second surface of the pillar contacts the routing line; a connection joint that electrically connects the routing line and the pad; and an encapsulant **308** that includes first and second opposing



surfaces, wherein the first surfaces of the pillar and the encapsulant face in a first direction, the second surfaces of the pillar and the encapsulant face in a second direction opposite the first direction, the chip, the pillar and the encapsulant extend vertically beyond the routing line in the first direction, the pillar is disposed outside a periphery of the chip, the routing line extends laterally from the pillar towards the chip, the chip and the pillar are embedded in the encapsulant, the encapsulant does not cover the first surface of the pillar, and the conductive trace extends through the first surface of the encapsulant, but fail to explicitly show wherein the pillar includes tapered sidewalls therebetween, and the tapered sidewalls are adjacent to the first and second surfaces of the pillar and slant inwardly towards the first surface of the pillar.

Lin is cited for show support circuit for a semiconductor chip assembly. Specifically, Lin (figures 1 to 4) specifically figure 1J discloses a conductive trace that includes a routing line 42 and a pillar 36, wherein the pillar includes first and second opposing surfaces and tapered sidewalls therebetween, the first surface of the pillar faces away from the routing line, the second surface of the pillar contacts the routing line, and the tapered sidewalls are adjacent to the first and second surfaces of the pillar and slant inwardly towards the first surface of the pillar forth purpose of reducing stress and improving reliability.

3. The assembly of claim 1, the combination with Nakatani et al. showing wherein the first surface of the chip faces in the second direction and the second surface of the chip faces in the first direction.
4. The assembly of claim 1, the combination with Nakatani et al. showing wherein the routing line extends vertically beyond the chip in the second direction.
5. The assembly of claim 1, the combination with Nakatani et al. showing wherein the routing line extends vertically beyond the pillar in the second direction.
6. The assembly of claim 1, the combination with Nakatani et al. showing wherein the routing line extends within and outside the periphery of the chip.
8. The assembly of claim 1, the combination with Nakatani et al. showing wherein the routing line is an essentially planar metal lead.
9. The assembly of claim 1, the combination with Nakatani et al. showing wherein the pillar is copper.
10. The assembly of claim 1, the combination with Lin showing wherein the pillar has a conical shape.

11. The assembly of claim 1, the combination with Nakatani et al. showing wherein the first surface of the pillar extends vertically beyond the chip in the first direction.

14. The assembly of claim 1, the combination with Nakatani et al. showing wherein the first surface of the pillar is laterally aligned with the first surface of the encapsulant.

16. The assembly of claim 1, the combination with Nakatani et al. showing wherein the second surface of the pillar extends vertically beyond the chip in the second direction.

17. The assembly of claim 1, the combination with Nakatani et al. showing wherein the first and second surfaces of the pillar are flat and parallel to one another, the first surface of the pillar has a first surface area, the second surface of the pillar has a second surface area, and the first surface area is at least 20 percent smaller than the second surface area.

18. The assembly of claim 1, the combination with Nakatani et al. showing wherein the encapsulant covers the chip.

23. The assembly of claim 1, the combination with Nakatani et al. showing wherein the connection joint is solder.

24. The assembly of claim 1, the combination with Nakatani et al. showing wherein the connection joint is conductive adhesive.

29. The assembly of claim 1, the combination with Nakatani et al. showing including an insulative base (**lower portion of 308**) that contacts the routing line, and extends vertically beyond the chip, the routing line and the pillar in the second direction.

30. The assembly of claim 29, the combination with Nakatani et al. showing wherein a through-hole (**lower portion of 308**) extends through the insulative base, and the connection joint **303** extends into the through-hole.

31. The assembly of claim 1, the combination with Nakatani et al. includes an insulative adhesive **308** that mechanically attaches the chip to the routing line and the pillar.

32. The assembly of claim 31, the combination with Nakatani et al. showing wherein a through-hole (**lower portion of 308**) extends through the adhesive, and the connection joint extends into the through-hole.

33. The assembly of claim 32, the combination with Nakatani et al. show wherein the adhesive contacts and is sandwiched between the routing line and the pad.

34. The assembly of claim 1, the combination with Nakatani et al. includes a first terminal **303** that contacts the first surface of the pillar, extends vertically beyond the pillar in the first direction and is spaced from the connection joint.

35. The assembly of claim 1, the combination with Nakatani et al. includes a second terminal **306** that contacts the routing line, extends vertically beyond the routing line in the second direction and is spaced from the connection joint.

36. The assembly of claim 1, the combination with Nakatani et al. includes a first terminal **303** that is plated on the first surface of the pillar, extends vertically beyond the pillar in the first direction and is spaced from the connection joint, and a second terminal **306** that is plated on the routing line, extends vertically beyond the routing line in the second direction and is spaced from the connection joint and the first terminal.

101. The assembly of claims 1, 41, 61, 71, 81 or 91, the combination with Nakatani et al. showing wherein the chip is the only chip embedded in the encapsulant.

102. The assembly of claims 1, 41, 61, 71, 81 or 91, the combination with Nakatani et al. showing wherein any chip embedded in the encapsulant is electrically connected to the pillar by an electrically conductive path that includes the routing line.

103. The assembly of claims 1, 41, 61, 71, 81 or 91, the combination with Nakatani et al. showing wherein any chip embedded in the encapsulant extends vertically beyond the routing line in the first direction.

104. The assembly of claims 1, 41, 61, 71, 81 or 91, the combination with Lin showing wherein the pillar is copper and has a conical shape.

105. The assembly of claims 1, 41, 61, 71, 81 or 91, the combination with Nakatani et al. showing wherein the first and second surfaces of the pillar are flat and parallel to one another.

108. The assembly of claims 1, 41, 61, 71, 81 or 91, the combination with Lin showing wherein the tapered sidewalls have a taper between 45 and slightly less than 90 degrees.

109. The assembly of claims 1, 41, 61, 71, 81 or 91, the combination with Lin showing wherein the tapered sidewalls have a taper of approximately 75 degrees.

Therefore, it would have been obvious to one of ordinary skill in the art to use Lin's pillar shape to modify Nakatani et al.'s pillar shape for the purpose of reducing stress and improving reliability.

Claim 22, **insofar as it can be understood**, is rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakatani et al. (U.S. Patent # 6,038,133) in view of Lin (U.S. Patent # 6,402,970 B1) and further in view of Fujitsu (U.S. Patent # 5,654,584).

The combination of Nakatani et al. and Lin show the features of the claimed invention as detailed above, but fail to explicitly show the connection joint is an electrolessly plated metal.

Fujitsu is cited for showing a semiconductor device having tape automated bonding leads. Specifically, Fujitsu (figures 1 to 11) specifically figure 1 discloses the connection joint is an electrolessly plated metal **20** for the purpose of preventing damage to the semiconductor chip under the electrode pad.

Therefore, it would have been obvious to one of ordinary skill in the art to use Fujitsu's plated metal connection joint to modify the combination of Nakatani et al. and Lin's connection joint for the purpose of preventing damage to the semiconductor chip under the electrode pad.

The listed references are cited as of interest to this application, but not applied at this time.

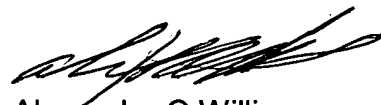
| Field of Search  | Date     |
|--|----------|
| U.S. Class and subclass:<br>257/774,773,775,776,737,738,734,778,779,790,783,784,7<br>86,693,692,691,690,698                                  | 10/23/05 |
| Other Documentation:<br>foreign patents and literature in<br>257/774,773,775,776,737,738,734,778,779,790,783,784,7<br>86,693,692,691,690,698 | 10/23/05 |
| Electronic data base(s):<br>U.S. Patents EAST  | 10/23/05 |

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander O. Williams whose telephone number is (571) 272 1924. The examiner can normally be reached on M-F 6:30AM-7:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272 1915. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2826

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Alexander O Williams  
Primary Examiner  
Art Unit 2826

AOW  
10/23/05